Claims

1. An apparatus for electrical power management of the recharging of a plurality of battery-powered computers having a one or more internal batteries, the apparatus comprising:

a plurality of electrical bus elements for connecting the plurality of battery-powered computers to the apparatus, the plurality of battery-powered computers distributively connected to the plurality of electrical bus elements to form a group of battery-powered computers connected to each one of the plurality of electrical bus elements;

a plurality of switching elements, each one of the plurality of switching elements having a load terminal exclusively connected to one of the plurality of electrical bus elements;

an ac power source having a limited current capacity generally less than a total maximum charging current for all of the plurality of battery-powered computers, the ac power source connected to a line terminal of each one of the plurality of switching elements; and

a means of controlling the plurality of switching elements whereby the ac power source is selectively connected to the plurality of electrical bus elements to recharge the one or more internal batteries without exceeding the limited current capacity of the ac power source.

2. The apparatus of claim **1** wherein the means of controlling further comprises a means of exclusive sequential closure of an each one of the plurality of switching elements for a period of time sufficient to recharge the one or more internal batteries for the group of battery-powered computers connected to the each one of the plurality of switching elements.

3. The apparatus of claim **1** wherein the means of controlling further comprises a means of exclusive simultaneous closure of a two or more of the plurality of switching elements for a period of time sufficient to recharge the one or more internal batteries for the groups of battery-powered computers connected to the two or more of the plurality of switching elements.

4. The apparatus of claim **1** wherein the means of controlling further comprises an i/o device having an output to each one of the plurality of switching elements to independently open and close each one of the plurality of switching elements, the i/o device having an input from a computer whereby the computer executes a program to send commands to the i/o device to selectively open and close each one of the plurality of switching elements.

5. The apparatus of claim **1** further comprising an ac-to-dc rectifier connected between at least one of the plurality of electrical bus elements and an at least one of the plurality of battery-powered computers to supply dc current to the at least one of the plurality of battery-powered computers.

6. The apparatus of claim **1** further comprising a one or more ac-to-dc battery chargers, each of the one or more ac-to-dc battery chargers having an ac input and a dc output, the ac input of each of the one or more ac-to-dc battery chargers connected to the load terminal of an at least one of the plurality of switching elements, and the dc output of each one of the one or more ac-to-dc battery chargers connected to an at least one receptacle suitably configured to connect to and recharge a one

or more batteries removed from the plurality of battery-powered computers.

7. The apparatus of claim **1** further comprising an at least one ac-to-dc rectifier having an ac input and a dc output, the ac input connected to the load terminal of an at least one of the plurality of switching elements and a dc output connected to an at least one of the plurality of electrical bus elements, whereby the at least one ac-to-dc rectifier supplies dc current to the plurality of battery-powered computers connected to the at least one of the plurality of electrical bus elements.

8. The apparatus of claim **7** further comprising a means for alternatively connecting each one of the plurality of battery-powered computers connected to the at least one of the plurality of electrical bus elements either to an electrical load or the at least one of the plurality of electrical bus elements connected to the dc output of the at least one ac-to-dc rectifier.

9. A method of recharging a plurality of battery-powered computers having a one or more internal batteries comprising the steps of:

connecting a line terminal of a plurality of switching elements to an ac power source of a limited current capacity;

connecting a load terminal of each one of the plurality of switching elements to one of a plurality of electrical bus elements;

distributively connecting the plurality of battery-powered computers to the plurality of electrical bus elements; and

controlling the plurality of switching elements to selectively supply a current from the ac power source to the plurality of electrical bus elements to recharge the one or more internal batteries for the plurality

of battery-powered computers without exceeding the limited current capacity of the ac power source.

10. The method of claim **9** further comprising the step of connecting an ac-to-dc rectifier between an at least one of the plurality of electrical bus elements and an at least one of the plurality of battery-powered computers connected to the at least one of the plurality of electrical bus elements to supply dc current to the at least one of the plurality of battery-powered computers.

11. The method of claim **9** further comprising the step of sequentially closing an each one of the plurality of switching elements for a period of time sufficient to recharge the one or more internal batteries for a group of battery-powered computers connected to an each one of the plurality of electrical bus elements connected to the each one of the plurality of switching elements.

12. The method of claim **9** further comprising the step of closing at the same time two or more of the plurality of switching elements for a period of time sufficient to recharge the one or more internal batteries for a group of battery-powered computers connected to a two or more of the plurality of electrical bus elements connected to the two or more of the plurality of switching elements.

13. The method of claim **9** further comprising the following steps of:

connecting an ac input of an ac-to-dc battery charger to an at least one of the plurality of electrical bus elements;

connecting an at least one battery removed from the plurality of battery-powered computers to a dc output of the ac-to-dc battery

charger; and

recharging the at least one battery by the supply of dc current from the ac-to-dc rectifier.

14. The method of claim **13** further comprising the step of alternatively connecting an at least one of the plurality of battery-powered computers to either an electrical load or to the at least one of the plurality of electrical bus elements connected to the dc output of the ac-to-dc battery charger.

15. The method of claim **9** further comprising the steps of connecting an ac input of an ac-to-dc rectifier to the load terminal of one of the plurality of switching elements, and connecting a dc output of the ac-to-dc rectifier connected to a one of the plurality of electrical bus elements.

16. An apparatus for electrical power management of the recharging of a plurality of battery-powered computers having a one or more internal batteries, the apparatus comprising:

an enclosure for housing:

a plurality of electrical bus elements for distributive connection of the plurality of battery-powered computers;

a plurality of switching elements, each one of the plurality of switching elements having a load terminal exclusively connected to each one of the plurality of electrical bus elements;

a power terminal for connection to an external ac power source, the power terminal connected to a line terminal of each one of plurality of switching elements; and

a one or more control devices to control the opening and closing of the plurality of switching elements; and

a storage area for the plurality of battery-powered computers.

17. The apparatus of claim **16** wherein the storage area is physically isolated from the interior of the enclosure and a plurality of ac power conductors pass through a conduit between the interior of the enclosure and the storage area, each one of the plurality of ac power conductors connecting one of the plurality of battery-powered computers to a one of the plurality of electrical bus elements.

18. The apparatus of claim **17** further comprising a plurality of ac-to-dc rectifiers situated in the enclosure, an ac input of each of the plurality of ac-to-dc rectifiers connected to a one of the plurality of electrical bus elements; a plurality of dc power conductors passing through conduit between the interior of the enclosure and the storage area, each one of the plurality of dc power conductors connecting one of the plurality of battery-powered computers to a dc output of a one of the plurality of ac-to-dc battery chargers.

19. The apparatus of claim **16** further comprising a one or more ac-to-dc battery chargers situated in the enclosure, an ac input of each one of the one or more ac-to-dc battery chargers connected to the load terminal of an at least one of the plurality of switching elements and a dc output of each one of the one or more ac-to-dc battery chargers connected to a one or more receptacles suitably configured to connect to and recharge a one or more a batteries removed from the plurality of battery-powered computers, the one or more receptacles located external to the enclosure.

20. The apparatus of claim **16** further comprising an at least one ac-to-dc rectifier situated in the enclosure, an ac input of each at least one ac-

to-dc rectifier connected to the load terminal of a one of the plurality of switching elements and a dc output of each at least one ac-to-dc rectifier connected to a one of the at least one of the plurality of electrical bus elements.

21. An apparatus for electrical power management of the recharging of a plurality of battery-powered computers having one or more internal batteries, the apparatus comprising:

a plurality of electrical bus elements for connecting the plurality of battery-powered computers to the apparatus, the plurality of battery-powered computers distributively connected to the plurality of electrical bus elements to form a group of battery-powered computers connected to each one of the plurality of electrical bus elements, the plurality of electrical bus elements arranged in two or more charging priority circuits for sequential priority charging of the plurality of battery-powered computers connected to each of the plurality of electrical bus elements;

a timer having a timer switching element controlled by the timer to close and open at selected times, the timer having a line terminal and a load terminal;

an ac power source having a limited current capacity generally less than a total maximum charging current for all of the plurality of battery-powered computers, the ac power source connected to the line terminal of the timer switching element to provide a supply current; and

a plurality of group charging current sensing devices, an each one of the plurality of group charging current sensing devices controlling the opening and closing of an associated group charging current switching device, the each one of the plurality of group charging current sensing devices exclusively sensing a group charging current provided by the supply current in a one of the two or more charging priority circuits, the

associated group charging current switching device disposed in a next charging priority circuit of the two or more charging priority circuits, whereby when the each one of the plurality of group charging current sensing devices senses a selected value of the group charging current that is equal to or less than the limited current capacity of the ac power, the associated group charging current switching device closes to provide the supply current to the next charging priority circuit.

22. The apparatus of claim **21** further comprising a main current sensing device associated with a main current switching element controlled by the main current sensing device, the main current sensing device connected in series with the timer switching element to sense a total connected charging current for all of the plurality of battery-powered computers, whereby the main current switching element closes when the main current sensing device senses a current at or above a selected value.

23. An apparatus for electrical power management of the recharging of a plurality of battery-powered computers having a one or more internal batteries, the apparatus comprising:

a plurality of electrical bus elements for connecting the plurality of battery-powered computers to the apparatus, the plurality of battery-powered computers distributively connected to the plurality of electrical bus elements to form a group of battery-powered computers connected to each one of the plurality of electrical bus elements;

a plurality of switching elements, each one of the plurality of switching elements having a load terminal exclusively connected to one of the plurality of electrical bus elements;

an ac power source having a limited current capacity generally less

than a total maximum charging current for all of the plurality of battery-powered computers, the ac power source connected to a line terminal of each one of the plurality of switching elements;

a controller having an output to each one of the plurality of switching elements to individually open or close each one of the plurality of switching elements;

a plurality of current sensing devices, each current sensing device sensing the magnitude of a bus charging current to each one of the plurality of electrical bus elements, or the magnitude of a computer charging current from each one of the plurality of electrical bus elements to each one of the plurality of battery-powered computers, each of the plurality of current sensing devices having an input to the controller that is proportional to the sensed magnitude of the bus charging current or the computer charging current, whereby the controller processes the input from all current sensing devices and selectively opens or closes the plurality of switching elements based upon the limited current capacity of the ac power source and the sensed bus or computer charging currents so that the limited current capacity of the ac power source is not exceeded.

24. The apparatus of claim **23** further comprising a plurality of ac-to-dc rectifiers, each one of the ac-to-dc rectifiers having an ac input connected to an at least one of the plurality of electrical bus elements and a dc output connected to an at least one of the plurality of battery-powered computers to supply a dc current to the at least one of the plurality of battery-powered computers.

25. The apparatus of claim **24** further comprising a plurality of dc current sensing devices, each of the plurality of dc current sensing

devices sensing the magnitude of the dc current, each of the plurality of dc current sensing devices having an input to the controller that is proportional to the magnitude of the dc current to the at least one of the plurality of battery powered computers, whereby the controller processes the input from all of the plurality of current sensing devices and selectively opens or closes the plurality of switching elements based upon the limited current capacity of the ac power source, the sum of the sensed magnitude of the bus charging current to each one of the plurality of electrical bus elements, and the sum of the magnitude of the dc current to the at least one of the plurality of battery powered computers so that the limited current capacity of the ac power source is not exceeded.

26. The apparatus of claim **23** further comprising a main current sensing device, the main current sensing device sensing the magnitude of a total charging current for all of the plurality of battery-operated computers, the main current sensing device having an input to the controller that is proportional to the magnitude of the total charging current for all of the plurality of battery-operated computers, whereby the controller processes the input from the main current sensing device and opens all of the plurality of switching elements if the total charging current is equal to or greater than a selected value.

27. An apparatus for electrical power management of the recharging of a plurality of battery-powered computers having a one or more internal batteries, the apparatus comprising:

a two or more stations for recharging the plurality of battery-powered computers, each of the two or more stations comprising:

a plurality of electrical bus elements for connecting a portion of the

plurality of battery-powered computers to the apparatus, the portion of the plurality of battery-powered computers distributively connected to the plurality of electrical bus elements to form a group of battery-powered computers connected to each one of the plurality of electrical bus elements;

a plurality of switching elements, each one of the plurality of switching elements having a load terminal exclusively connected to each one of the plurality of electrical bus elements;

an ac power source having a limited current capacity generally less than a total maximum charging current for all of the plurality of battery-powered computers, the ac power source connected to a line terminal of each one of the plurality of switching elements;

a means of controlling the plurality of switching elements; and

a computer for executing a program to send commands to the means of controlling to selectively open and close each one of the plurality of switching elements whereby the ac power source is selectively connected to the plurality of electrical bus elements to recharge the one or more internal batteries in the plurality of battery-powered computers without exceeding the limited current capacity of the ac power source; and

a means for communicating between the computer at each of the two or more stations, whereby recharging of the one or more internal batteries at each of the two or more stations is coordinated among all of the two or more stations.